

Fey is disqualified as prior art against the claimed invention, under 35 USC 103(c), since that subject matter and the claimed invention were at the time the invention was made owned by the same person.

Applicant argues that the independent claims 1, 16, 31, and 34 are allowable as amended and presented. Therefore the dependent claims are allowable as containing further limitations of the allowable claims.

In view of all of the foregoing, it is respectfully submitted that the pending claims 1-38 are allowable as amended and in the present application.

Reexamination and allowance are respectfully requested.

DISCUSSION

Claim 34 Objection under 35 U.S.C. § 112

Claim 34 has been amended to eliminate the limitation to tetragonal zirconia polycrystal.

Fey is Disqualified as Prior Art under 35 USC 103(c)

The Office Action beginning at page 7, para. 2 states that claims 11-14, 22-26, 29-30 are unpatentable over Lasater in view of either Bealka or Fey. Fey is again referenced on page 7 in para. 3, 4, 5; and on page 8, paras. 1 and 2. Applicant argues that these objections are overcome by a showing under 35 CFR 103(c); MPEP 706.02(l)(2).

Application 10/697,149 and Patent 6,521,350 (Fey) were, at the time the invention of Application 10/697,149 was made, owned by The Alfred E. Mann Foundation for Scientific Research.

In view of this argument, Applicant will not discuss the differences between Fey and the instant application.

The 103(a) objections based on Fey regarding claims 11-14 and 22-25, 26, and 29-30 having been overcome, these claims are allowable as dependant claims to an allowable independent claim (claim 30 limits dependent claim 16) or when combined with all of the limitation of the preceding claims.

The 35 USC 103(a) Objections are Overcome

Claims 1, 3-10, 15-16, 18-21, 27-28, 34-35, and 37-38 are rejected in the Office Action as being unpatentable over Lasater in view of Bealka.

Lasater does not refer to a "titanium-nickel interlayer to join the parts" at the cited references (col 1, ln. 7-13 and col 7, ln 26-42) or elsewhere. Lasater consistently and frequently refers to "the sealing alloy" or "a titanium-nickel alloy filler material." The instant application is differentiated from Lasater by the difference between an "alloy" and a layered interlayer material. For example, the application refers to, "The interlayer material 8 is preferably a clad foil comprised of at least one layer of nickel and one layer of titanium. Layering allows liquidus formation in the foil at a lower temperature than with an alloy of equivalent composition." (application page 4, para. 2)

An alloy is "a homogeneous mixture or solid solution of two or more metals..." or a "mixture" (American Heritage College Dictionary, 4th ed, copyright 2004). The instant invention is comprised of discrete layers of different materials.

Lasater is silent to the metal member 22 being a noble metal, arguably because he knew that an alloy of titanium and nickel should not bond to a noble metal member in the manner that he disclosed. On the other hand, the interlayer material of the instant invention has been found to develop a strong bond with noble metal.

Bealka discloses the use of conventional "brazing material 18" comprised of gold, copper, silver or alloy thereof. (Col 5, ln 30-31) He brazes a wire lead 20 (comprised of titanium, niobium, tantalum, stainless steel, or alloys thereof) (col 5, ln 8-10) with braze material 18.

The instant application does not utilize braze material that is comprised of gold, copper, silver or an alloy thereof; rather the "interlayer material 8" is preferably comprised of at least one layer of nickel and one layer of titanium. The material and the method of brazing between Bealka and the instant application are not analogous. Bealka's use of platinum as a thin wire lead does not teach the instant invention wherein brazing is accomplished with a layered braze material.

Further, as discussed above, Lasater does not disclose a laminate braze material, hence objections to Lasater in view of Bealka are overcome. The objections to claims 1, 3-10, 15-16, 18-21, 27-28, 34-35, and 37-38 are overcome and the rejection of these claims should be withdrawn.

Addressed in the order that they were addressed in the Office Action, dependent claims 2, 3, 4, 6, 7, and 19 are allowable as further limitations on an allowable claim.

Dependent claim 9 is objected to in the Office action citing Lasater teaching a eutectic liquidus formation at col 3, ln 13-33. However, Lasater neither teaches nor mentions a "eutectic" anywhere in the patent at all. He refers instead, at lines, 13, 21 and 23, to a "sealing alloy." It is well settled that this alloy is a stable, intimate mixture of nickel and titanium at the percentages specified by Lasater. As is best understood, Lasater discloses heating the assembly under vacuum until the alloy melts, when in contact with the metal and ceramic, and forms liquid that bonds the ceramic and metal together when cooled. The instant application uses a laminate that is in contact with an inert, noble metal to which ceramic is bonded by means involving a laminate braze material.

Claim 9 is therefore allowable as containing a further limitation of claim 1.

Dependent claims 10 and 21, and 15 are allowable as containing further limitations of claim 1, namely a thickness limitation and a hermeticity requirement.

Independent claim 16 is objected to according to Lasater teaching "...that the assembly is formed in a non-reactive atmosphere such as a vacuum by heating to a bonding temperature between the liquidus temperature but below the melting point of the metal part." [Office Action p 4, last para.] However, Lasater recites that "the preferred sealing temperature is between about 1000° C. and 1100° C....", he recites that the sealing alloy is capable of forming a liquidus at less than 1150° C [col 3, ln 21-23], he recites that the sealing alloy forms a liquidus which wets and seals the interface surfaces [col 8, ln 45-47], but he does not teach a bonding temperature between the liquidus temperature and below the melting point of the metal part. Applicant finds no recitation in Lasater of the melting point of the metal part at all. Claim 16 is therefore in condition for allowance.

Dependent claims 18 and 27-28 are allowable as containing further limitations on independent claim 16.

Independent claim 34 describes the selection of a bonding temperature that is less than the melting point of the metal part and greater than the liquidus temperature of the interlayer material, which is a laminant of titanium and nickel. Lasater discloses a sealing alloy while Bealka does not teach selection of the brazing temperature. Nor does Bealka recite liquidus formation, most likely because gold, copper, and silver melt congruently and do not involve eutectic or paritectic liquidus formation.

There is no motivation in Bealka to combine these disclosures. Accordingly claim 34 is in condition for allowance.

Claims 35 and 37-38 are allowable as containing further limitations on allowable claim 34. As previously discussed, the instant application differs from Lasater in that Lasater relies on an alloy, while applicant relies on an interlayer laminate which has significantly different metallurgical properties. Bealka teaches bonding certain noble metals by brazing with gold, copper, silver, or alloys thereof. Bealka did not anticipate the use of a high temperature laminate braze material at all and does not, for example, mention nickel and titanium as a braze material for noble metals.

Applicant finds neither a recitation nor motivation in Bealka to combine his method of brazing with that disclosed by Lasater. Accordingly, the claims are in condition for allowance.

Independent claim 31 and dependent claims 2, 17, 32-33, and 36 are rejected as being unpatentable over Lasater in view of Bealka, further in view of Hirano. Hirano discloses a foil brazing material having a core of Ti and outer layers of Ni or a Ni alloy. [col 2, ln 13-15] Hirano does not disclose or discuss brazing noble metals. He discusses bonding oxide ceramics "...to an article of metal (such as Ti, Mo, W, and Cu), alloy (such as Cu-W, Kovar, and 42% Ni-Fe alloy, or composite material (composed of Kovar and Cu or 42% Ni-Fe alloy and Cu)" col 2, ln 35-42.

In the instant application, claim 31, is specifically directed to bonding noble metals, such as "platinum, iridium, palladium, ruthenium, rhodium and their respective alloys" [claim 31] to a "tetragonal zirconia polycrystal ceramic" [claim 31]. There is no suggestion that Hirano is capable of bonding a noble metal by his disclosed approach. It is not obvious that a noble metal can be bonded as a replacement for his disclosed metals. Lasater does not suggest the approach disclosed by Hirano as a method of bonding noble metals, since Lasater does not disclose bonding of noble metals. Bealka does not suggest that Hirano is applicable for bonding noble metals but rather discloses the use of a different class of braze materials than that disclosed by applicant. Claim 31 is allowable as presented.

Claim 2 is allowable as containing a further limitation of allowable independent claim 1. Claim 17 is allowable as containing a further limitation of independent claim 16. Claims 32 and 33 contain further limitations of independent claim 31. Claim 36 is containing a further limitation of independent claim 34.

In view of all of the foregoing, it is respectfully submitted that all of the pending claims 1-38 are allowable as amended and reexamination and allowance are respectfully requested.

If for any reason the Examiner finds the application other than in condition for allowance, the Examiner is requested to call the undersigned attorney at the Los Angeles, California area telephone number (661) 702-6814 to discuss the steps necessary for placing the application in condition for allowance.

Respectfully submitted,

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Date



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